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PREHISTORIC EUROPE

Prehistoric Europe. A Geological Sketch. By James Geikie, LL.D., F.R.S. 8vo. (London: Stanford, 1881.)

Les Premiers Hommes et les Temps Préhistoriques. Par le Marquis de Nadaillac. Two vols. 8vo. (Paris: Masson, 1881.)

THE condition of Europe outside the reach of history and the changes by which it has come to be what it is, the appearance of man and his progress in culture, combine to form a subject which cannot, in our opinion, be treated satisfactorily in the present state of knowledge. New facts are being daily brought to light, the speculations of yesterday are being tested by the discoveries of to-day, and the accumulation of materials necessary to form a sound judgment even in any one department, such, for instance, as archæology, is so great, that it may well daunt the courage of the boldest writer who knows the nature of the task before him. In the two books before us the subject is treated from totally different points of view. Dr. James Geikie takes his stand upon the glaciated mountains of Scotland, and attempts to throw the glacial net woven in his previous work, "The Ice Age," over the whole of Europe, and the Marquis de Nadaillac records the facts which he has collected from various quarters, America included, in what may be called a prehistoric gazetteer. The one avowedly takes up the position of an advocate, and pushes glacialism and interglacialism to an extreme, while the other takes the safer, though humbler, ground of a man who has no original views to put forward. The works of both will be useful exactly in proportion to the knowledge and judgment of the reader. There is wheat in both works, but it needs a careful winnowing, as we shall proceed to show.

In his previous work Dr. James Geikie proposed a classification of the Pleistocene deposits of Europe based mainly on observations which he has made in certain parts of Scotland, and attempted a more minute subdivision of the glacial strata than the threefold arrangement generally recognised by European geologists. He advocated a complicated series of arctic glacial and of warm interglacial periods, layers of clay with boulders representing the one, and strata of sand, gravel, loam, or peat the other. His views are by no means accepted, even for Scotland, and the small progress made in general classification during the last twenty years may be estimated from the fact, that scarcely any two geologists agree in correlating the clays and sands on the east and west side of the Pennine Chain with one another and with the glacial strata of Wales, Cumbria, or Scotland. There also is a considerable difference of opinion as to the clays themselves having been derived from glaciers or from icebergs. In his present work he treats these difficulties as solved, and devotes one large section to show "English geologists" (why English?) that all the fluviatile and cave-accumulations with Palæolithic man and the Pleistocene mammalia usually termed Post-glacial, are "of Interglacial, and not of Post-glacial date." The latter term is here used in the sense of being "later than the last great

extension of glacier ice in Europe," while the former represents the interval of time between the retreat of one set of glaciers and the advance of another, or that between the deposits of one set of icebergs and those of another. Lyell, Prestwich, Evans, Hughes, and the great majority of those who have worked at the subject hold that the Pleistocene mammalia invaded Europe before the glacial cold had set in, and swung to and fro according to the fluctuations of temperature while the glaciers were advancing and retreating, and that there is proof that Palæolithic man and the extinct animals were in Britain "after the last great extension of the glaciers" (if they were glaciers and not icebergs). We will then appeal to the facts which have been repeatedly urged in the *Proceeding* of the Geological Society and of the Anthropological Institute, as well as in most of the separate works published in Britain since the year 1860.

The area over which Palæolithic implements and Pleistocene mammalia occur in direct relation to the glacial deposits is principally the valley of the Thames and of the Severn, and the Midland and Eastern counties. In the first of these they occur in fluviatile strata, such, for example, as the gravels on which London stands, which are composed of materials derived from the destruction of "the chalky boulder clay." In the valley of the Severn the Pleistocene mammalia are imbedded also in the *detritus* of the boulder clay of that region (Lucy). In the neighbourhood of Cambridge (Hughes, Fisher) the same is the case. In the neighbourhood of Bedford, Wyatt, Prestwich, and Lyell pointed out long ago, not only that the gravels containing the flint implements and fossil mammals were composed of materials that resulted from the wreck of the boulder clay, but that the deposit rested in a hollow which had been cut through "the great chalky boulder clay" of the district. At Hoxne the mammaliferous gravels with Palæolithic implements rest on that boulder clay. The clays in question are the only signs of the extension of glaciers (? icebergs) over those districts, and the fluviatile deposits are obviously of later date. This conclusion Dr. James Geikie does not venture to dispute, but he asks us to believe that formerly another sheet of boulder clay has covered up all these deposits, and that it has been removed so completely that no trace of it is now to be seen. He fixes his attention on the purple clay and the Hesse clay, which occupy an exceedingly limited area, in Yorkshire and Lincolnshire, and imagines that they represent glacial periods, one of which, not specified, extended over the fluviatile strata in question, and caused these strata to be inter- instead of post-glacial. These boulder clays are local and unimportant, and have not been met with over any deposit containing Palæolithic implements. In advancing this speculation he is drawing a cheque on our credulity which is not likely to be honoured. The strata in question are proved by their position to be later than the glacial deposits of the districts in which they occur; it is for him to prove that they are earlier than glacial deposits elsewhere. This he has not done. Still less can his conclusion be accepted that Palæolithic man and the Pleistocene beasts associated with him are solely "interglacial" in Britain and on the Continent in non-glaciated areas. The cases quoted above, and they might be greatly increased, prove that man and the Pleistocene beasts were

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in Europe "after the last great extension of glaciers"—or in the Post-glacial times.

There is also reason to believe that man was living in Europe before and during the Glacial period, or, in other words, in Pre-glacial, Glacial, and Inter-glacial times, although the alleged discovery of man in the Victoria Cave, relied upon by Dr. J. Geikie, has been shown to have been founded on a mistake, and the interglacial age of the implements at Brandon and Thetford, which he quotes as being of great importance, is not accepted by very good judges such as Dr. Evans and Prof. Hughes. These however may be dismissed as throwing no light on the question as to the existence of man in Britain after the great extension of the glaciers.

Dr. J. Geikie's method of arriving at the climate of his "Inter-glacial periods" is equally faulty. He considers that they were warm and genial, because of the presence of certain land shells, such as *Cyrena fluminalis*, the climatic value of which is at present unknown, of certain marine shells, the distribution of which is dependent on the warm and cold currents, and of land-mammalia now found only in southern latitudes, such as the hippopotamus, the limit of whose endurance of cold is yet to be proved, since those in the Zoological Gardens in London will take their tubs in frosty weather. But, unfortunately for his argument, the last animal is associated with arctic species, such as the reindeer, in all the caves (Kirkdale, Durdham Down, &c.) except two, and in all the river deposits (Bedford, Acton, &c.) except some three or four, in which it has been found in this country. With equal reason we might argue that the climate was arctic from the presence of reindeer. The consideration which he urges, that the two groups of animals could not live side by side because they do not live now, is met by the direct testimony of their associated remains, not merely in this country but on the continent. The hyænas, for example, of Kirkdale and of the Vale of Clwyd ate reindeer and hippopotamuses, and dragged them into their dens, where their gnawed fragments occurred in one and the same stratum. We may remark that in dealing with the fauna of the Victoria Cave Dr. J. Geikie omits all notice of the reindeer, the presence of which destroys his argument as to climate. This selection may be taken as a fair sample of the mode in which he has dealt with the whole evidence offered by the Pleistocene mammalia. He deals with it, not with the impartiality of a judge, but as an advocate; and has only called those witnesses which count on his side. The vast numbers of reindeer associated with the remains of Palæolithic man from the caves of Cresswell as far as the Alps, and from the Pyrenees into the valley of the Danube, prove that the climate in those regions was in those times not "a warm inter-glacial" climate, but one in harmony with that indicated by the blocks of stone in the gravels pointed out by Prof. Prestwich.

The interglacial net is spread far and wide over the Continent. It includes not merely the forest with fig-trees and Judas-trees and laurestinas of Moret, which, as Saporta points out, would have been killed off by a spell of hard frosts, to say nothing of such a climate as is implied by the supposed preceding Glacial period, of which there is no evidence in that locality. It covers the deposits of Mont Perrier, near Issoire, from which MM.

Croizet and Jobert obtained a rich fauna, universally considered typical upper Pleiocene. It covers also the mammaliferous deposit of Liffe, near Gandino in the Italian Alps, in which the mammalia identified by Forsyth Major are unmistakably Pleiocene. It is even stretched so as to take in the so-called Pleiocene man of Olmo, near Arezzo, the age of which, as Dr. Evans has pointed out, is proved to be Neolithic by the associated implements. Thus we have things of widely different and of well-ascertained age grouped together under the head of "inter-glacial," and we have in this fact proof that the classification is so far worthless, as indeed every system must be which is based on ice, and ice only.

In further illustration of this we may quote the view of our author, that in the period usually termed Prehistoric, or recent, but by him "Post-glacial," Europe was connected by land with the Farøes, Iceland, and Greenland, and that the climate was genial. It is assumed that the "last glacial period" killed off all the Pleistocene forests in those latitudes, and that the present traces of forests are the result of subsequent growths, extending from one point to all the rest along a continuous tract of land. If we allow this, surely in the far north, to say the least, they are "interglacial," seeing that they are wedged in between "the last Glacial period" and the present glacial conditions. But we can allow neither his assumption nor can we accept his geography. The Post-glacial glaciers of Scotland spoken of on p. 526 seem to us proof that the ice-classification breaks down, and the admission that the Great Ice age is merely "a stage or phase of the Pleistocene period" is a frank confession tending in that direction.

It is only necessary to say a few words about the two large volumes of the Marquis de Nadaillac. His attitude of reserve with regard to Miocene and Pleiocene man is judicial and impartial. But we would point out that here and there in the work serious errors are to be remarked. He considers, for example, the Archæopteryx a tertiary bird; he associates the Liassic fish of Lyme Regis with the "Tertiary fishes of Lebanon and Monte Bolca," and he writes of the Ichthyosaurus and Plesiosaurus as if they belonged to the Eocene age.

In neither of these works can we find any addition to what has been already known about Prehistoric Europe, and in both there are omissions of well-known facts which it is impossible to notice within the limits of these columns.

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THE BIOLOGY OF PLANTS

Beiträge zur Biologie der Pflanzen. Herausgegeben von Dr. Ferdinand Cohn. Vol. ii. part 3, with 5 plates; vol. iii. parts 1 and 2, with 15 plates. (Breslau: J. U. Kern, 1877, 1879, and 1880.)

IN the concluding part of the second volume of the well-known *Beiträge* three out of four papers are devoted to fungi and Bacteria, one only being physiological. This physiological paper is by Dr. Just, on the action of high temperatures upon the preservation and germination of seeds. The experiments, which are described in minute detail, were made with Nobbe's germinating apparatus and a thermostat. Horstmann's thermostat, which was the one employed for all tempera-